(19) Japan Patent Office (JP)
(12) Publication of Unexamined Patent Application (A)
(11) Japanese Patent Laid-Open Number:Tokkai2000-246060
(P2000-246060A)
(43) Laid-Open Date: Heisei12-9-12 (September 12, 2000)

(51) Int.Cl.[7]	Identification Code	FI	Theme Code(Reference)
B01D 53/70		B01D 53/34	134E
53/32		53/32	
53/34	ZAB	B01J 19/08	Z
B01J 19/08		C07D319/24	
// C07D319/24		B01D 53/34	ZABZ

Request for Examination: No request to be done
Number of Inventions: 8 OL (7 pages in total)
(21) Application Number: Tokugan Hei11-370139
(22) Filed: Heisei 11-12-27 (December 27, 1999)
(31)Priority Number:Tokugan Hei10-378543
(32)Priority Date:Heisei 10-12-28(December 28,1998)
(33)Priority Country:Nippon(JP)
(71) Applicant: 398071897
Sadao Tanaka
3-4-1-107 , Toyotamaminami,Nerima-ku,Tokyo
Tanaka Gijyutsushi Jimusyo
(72) Inventor: Sadao Tanaka
3-4-1-107 , Toyotamaminami,Nerima-ku,Tokyo
Tanaka Gijyutsushi Jimusyo
(74) Agent: 100083736 Patent Attorney; Sadao Tanaka

(54)[Title of the Invention]

METHOD AND APPARATUS FOR RAPID REDUCTION OF DIOXIN

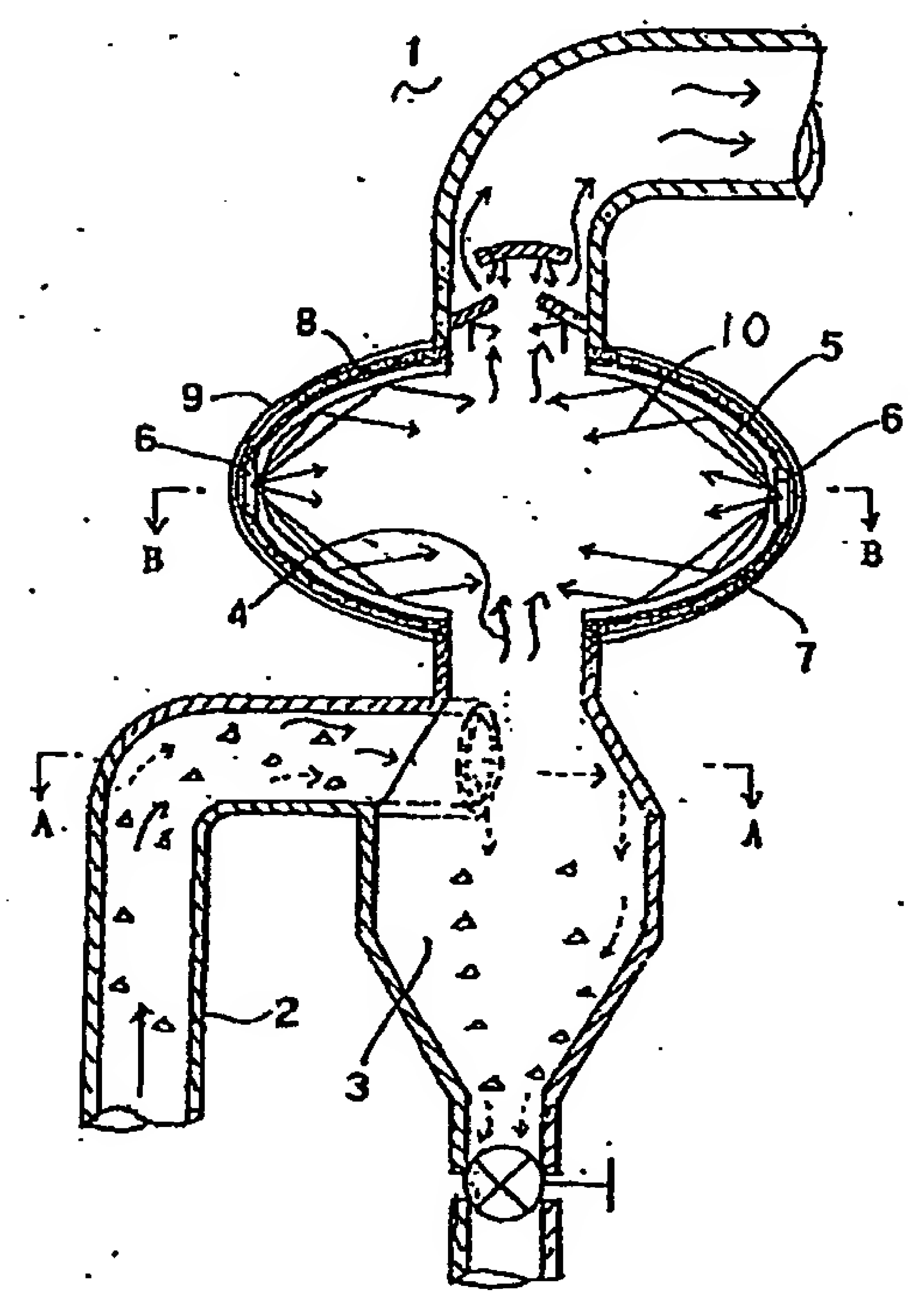
(57)[Abstract]

[Subject]

According to the specifications by public offices, a countermeasure against dioxin in the related art is required to raise processing temperature equal to or above 850 [°C] and is very costly. Therefore, it is difficult for a general operator to implement such a countermeasure. As a consequence, the countermeasure against dioxin has not been sufficiently processed by both public and private sectors yet, and remains as a big socially problem. A subject of the present invention is to resolve such a problem.

[Solution]

In the present invention, molecular bonds of dioxin are released by using methods of approximately endless reflections of electromagnetic waves, and thereby attempting rapid detoxification. Due to processing at a relatively lower temperature as compared to that of a conventional technique, equipment costs and running costs are significantly reduced. In this way, novel method and apparatus affordable by a general operator are provided.



[Claims]

[Claim 1]

A method for rapid reduction of dioxin which is a method using electromagnetic waves for decomposition and reduction of dioxin in exhaust gas, comprising the steps of:

infusing exhaust gas having a temperature adjusted to a range from 300 to 600 [°C] from an inlet in one direction of a container for passing through the exhaust gas;

allowing the exhaust gas to pass through toward outlets in plural directions;

introducing electromagnetic waves into the container or providing an electromagnetic ray generator at the inside thereof; and

allowing other inner surfaces to repeatedly reflect the electromagnetic waves approximately endlessly.

[Claim 2]

The method for rapid reduction of dioxin according to claim 1,

wherein electricity used in the method for rapid reduction of dioxin is ultraviolet rays, and

a wavelength of the ultraviolet rays is in a range from 100 to 360 [Nm] inclusive.

[Claim 3]

An apparatus for rapid reduction of dioxin which is an apparatus for rapidly reducing dioxin by allowing exhaust gas to pass through while using electromagnetic waves, comprising:

at least one dioxin rapid reducer arranged in a direction of flow of the exhaust gas;

wherein a shape of an inner surface reflector of an exhaust gas passage container is formed into a shape so as to reflect the electromagnetic rays entirely or partially to inside of the passage container;

the exhaust gas passage container includes an automatic temperature control mechanism for adjusting temperature of the exhaust gas in a range from 300 to 600 [°C];

the exhaust gas passage container includes any of a mechanism for generating ultraviolet rays having a wavelength in a range from 100 to 360 [Nm] inclusive when the electromagnetic waves are the ultraviolet rays, and a mechanism for introducing the ultraviolet rays obtained by separating full-wave light with a spectroscope into the passage container through an optical fiber; and

the dioxin rapid reducer is provided with inner surface reflectors at an inlet and an outlet for the exhaust gas for reflecting the electromagnetic rays to the inside of the passage container.

[Claim 4]

The apparatus for rapid reduction of dioxin according to claim 4,

wherein the inner surface reflector is formed either as a metal plate having a smooth inner surface and containing a simple substance or an alloy including at least one selected from the group consisting of iron, copper, silver, tin, aluminum, platinum, gold and palladium, or as transparent reinforced glass provided with a thin film on an outer back surface formed by sputtering or vapor deposition, the thin film containing a simple substance or an alloy including at least one selected from the group consisting of copper, silver, tin, aluminum, platinum, gold and palladium.

[Claim 5]

The apparatus for rapid reduction of dioxin according to any of claims 3 and 4,

wherein the shape of the dioxin rapid reducer configured to reflect the electromagnetic rays entirely or partially to the inside of the passage container is formed into any of a spherical shape, a cylindrical shape having an axis along a direction of allowing the exhaust gas to pass through or an approximate direction thereof, a spheroidal shape, a paraboloidal shape, and approximate shapes or an intermediate thereof, which is an approximately endless reflector.

[Claim 6]

The apparatus for rapid reduction of dioxin according to any of claims 4 to 6,

wherein the dioxin rapid reducer includes a dust removal mechanism.

[Claim 7]

The apparatus for rapid reduction of dioxin according to any of claims 3 to 6,

wherein the dust removal mechanism is a cyclone dust removal mechanism, and is provided in front of the inlet for the exhaust gas of the dioxin rapid reducer or below the dioxin rapid reducer.

[Claim 8]

The apparatus for rapid reduction of dioxin according to any of claims 6 and 7,

wherein the dust removal mechanism is a heat-resistant inner surface shield wiper closely contacting inside of the inner surface reflector and configured to reciprocate continuously or intermittently, and

movement thereof is monitored through at least one observation window made of transparent reinforced glass and provided on an upper surface of the inner surface reflector.

[Detailed description of the Invention]

[0001]

[Technical field of the Invention]

The present invention relates to a rapid reduction method and a reduction apparatus for dioxin generated in incineration processing of industrial waste and municipal waste. In other words, the present invention intends to provide a novel and previously unobvious method attempting to rapidly reduce and substantially detoxify dioxin, which is a highly toxic substance generated in the course of processing used waste, or so-called the venous industry, in contrast to mass production industries of all kinds of products required in diversified lifestyles of the human being today, or so-called the arterial industry. The present invention also intends to provide an apparatus which is relatively

less expensive than before and is actually applicable to an existing incinerator.

[0002]

[Related Art]

Today, tetrachlorodibenzo-para-dioxin, polychlorinated dibenzo-para-dioxin, and/or polychlorinated dibenzofuran, etc. are mainly referred to as dioxin. According to molecular structural formulae thereof, structures of dioxin are that chlorine, hydrogen, and oxygen atoms are bonded to various positions of benzene rings mainly composed of carbon atoms. It is known that isomers and related compounds of about 200 types or more exist and that various types of dioxins are generated when incinerating waste. Here, this dioxin is extremely poisonous, and it is said that the dioxin has a toxicity which is several times as high as sarin and more than twenty thousand times as high as potassium cyanide. Moreover, the harm to the human being may be acute and chronic. To be more precise, there are big problems in terms of carcinogenicity, weight losses and general declines in physical strength, teratogenicity, reprotoxy, breast milk contamination, immunotoxicity, and the like. However, reasonable and economical solutions have been hardly ever developed.

[0003] Accordingly, the Japanese government such as Ministry of Health and Welfare has finally opened an investigation committee and the like and has disclosed a "guideline for dioxin emission control" in 1997. According to the guideline, a regulated value thereof is 0.1 [ng/Nm^3] at incineration temperature equal to 850 [°C] or above, or more preferably equal to 900 [°C] or above, in case of a newly built incinerator. Meanwhile, an expected value of dioxin in exhaust gas from an existing incinerator after rebuilding is anticipated to be 0.5 [ng/Nm^3]. These regulated value and expected value are disclosed in Japanese national office publications.

[0004] However, referring to measurement facts of dioxin which was disclosed by Ministry of Health and Welfare as of April 1, 1997, relevant values are in a range from 990 to 301 [ng/Nm^3] in

garbage disposal incinerators in Hyogo prefecture, Miyazaki prefecture, Nagasaki prefecture, Chiba prefecture, Iwate prefecture, and the like, and average values in these cases are in a range from about 500 to 600 [ng/Nm^3]. Accordingly, these actual values are about 1000 times as high as the above-mentioned expected value and about 5000 times as high as the regulated value, and are far behind to meet the regulation or even the expectation by Ministry of Health and Welfare. Moreover, since these values were recorded one or two years ago, it is highly likely that dioxin concentration in the exhaust gas has remained in an extremely bad situation until today. However, there are very few sites left for simply landfilling combustible materials in the waste instead of incineration. Even if there are some sites left, such sites cannot be put into use due to objection of local citizens. Therefore, with exception of portions of raw garbage recyclable as manure, the conventional techniques do not allow any other choice than minimizing the volume once incinerated as the second best way. Given this circumstance, the following have been heretofore proposed as relatively new techniques for solving the above-mentioned dioxin problems.

[0005] A first conventional technique is a refuse-derived fuel process. This process technique is configured to remove noncombustible waste from general waste, to crush and dry combustible waste, and to add either slaked lime or quicklime and form the waste into pellets for use as fuel. Such pellet fuel is abbreviated as RDF. Outlines of the processes include: (1) acceptance of waste and removal of large pieces of metal; (2) rough crushing; (3) drying and deodorization; (4) removal of small pieces of metal, glass, stones and the like by secondary sorting; (5) fine crushing; (6) blending 2% to 7% of limes; (7) compression into about 40-mm sizes; and so on. The volume is reduced by less than half and the lime prevents putrefaction and mold growth. When the pellets are used as the fuel, chlorine gas derived from the waste reacts with the lime and generates calcium chloride, and thereby suppressing generation of dioxin.

[0006] A second conventional technique is an incinerated ash melting process. The dioxins discharged from normal incineration facilities are mainly included in incineration ashes. Therefore, the ashes are melted at high temperature and the dioxins generated in this process are thermally decomposed by the high temperature at the same time. Since the ashes are mainly composed of inorganic materials, the melting temperature needs to be set in a range from about 1200 to 1500 [°C]. The ash melting method includes at least three modes, namely, (1) a burner melting mode, (2) an electric melting mode, (3) a subsidiary material melting mode, and the like. The respective modes will be described. In the burner melting method, a surface of an ash layer in a furnace is melted with a burner using heavy oil or city gas, and then the entire ash is gradually melted. This mode further includes a rotary surface melting mode, a rotary kiln melting method, and the like. The former mode is a vertical rotary type and a ceiling portion thereof has a vertically elevating mechanism. Accordingly, it is possible to conduct an operation in conformity to a required processing amount to some extent. The latter mode is a horizontal rotary type. Next, the electric melting mode is configured to generate electric power using exhaust heat from garbage incineration and to melt garbage incineration ashes by use of the electricity. Since installation of power generation facilities are costly, this mode is suitable for a large-sized incineration site. The electric melting modes include a plasma mode, an electric resistance heating mode, a high (low) frequency induction heating mode, an arc mode, and the like. The plasma mode is dominant in these days. This is a mode configured to generate an electric arc by a plasma torch, to change inactive gas such as nitrogen into plasma, and to melt ashes with the plasma flame. The melted material is drained out of the furnace and rapidly cooled down into a slag. Since the melting is performed at a high temperature of 1000°C or above, dioxin is thermally decomposed.

[0007] A third conventional technique is a method of incinerating

and decomposing gasified dioxin. This is a method configured to add a subsidiary material such as coke or limestone to general waste, to incinerate the waste at a high temperature from 1500 to 1600 [°C], to change a melted material into a slag, and meanwhile to incinerate and detoxify carbon dioxide and dioxin by use of gas generated at high temperature.

[0008] A fourth conventional technique intends to decompose and detoxify dioxin by firstly separating combustible materials from general waste, then incinerating this at a temperature from 200 to 300 [°C], and then raising the temperature of the exhaust gas to 850 [°C] or above. Meanwhile, this is a method adopted and recommended by public offices at the moment.

[0009] A fifth conventional technique is a method of decomposing a substance containing dioxin by irradiating sunlight or ultraviolet rays. In case of sunlight, it is said to be attributable to an operation of ultraviolet rays included in the sunlight. Meanwhile, it is confirmed by way of experiment that 2, 3, 7, 8-TCDD, which is considered to be the most toxic dioxin, is decomposed in about 24 hours by the sunlight and in about 8 hours by the ultraviolet rays. Meanwhile, it is said to be confirmed by way of example that, by spraying a substance containing dioxin onto a surface of a leaf of a plant and by irradiating the sunlight thereon, the residual dioxin falls equal to or below 30 [%] in about 6 hours.

[0010] According to a sixth conventional technique, low-frequency pulse discharges at 20 to 200 times per second are applied to exhaust gas in an incinerator, and 90 [%] or more dioxin in the exhaust gas can be decomposed by use of plasma.

[0011]

[Problems to be solved by the Invention]

The first conventional technique attempts to reduce dioxin by manufacturing the RDF. Since the lime and the like are added, the generated hydrogen chloride is neutralized and relatively homogeneous components are obtained as fuel. Accordingly, it is expected that a stable incineration condition can be obtained and an amount of generation of dioxin can be thereby reduced.

However, RDF manufacturing and processing facilities require large-sized plant equipment in the garbage sorting process, the crushing process, the drying process, the blending process of slaked lime or quicklime, the pelletizing process, and the like. Further, the manufacturing and processing facilities also require facilities for managing the incineration state, facilities for processing the exhaust gas, and the like. Therefore, this technique has disadvantages such as a necessity of massive capital infusion. In addition, this method has numerous disadvantages which are problematic in the sense, that the problem dioxin may be generated in the RDF manufacturing process, that it is extremely difficult to ensure stable customers for the RDF as commercial fuel, that the RDF emits evil smells when stored unsold for a long time, and the like.

[0012] The second conventional technique involves the incinerated ash melting process. Since this method requires the melting temperature in the range from 1200 to 1500 [°C], all of the modes including the burner melting mode, the electric melting mode, and the subsidiary material melting mode requires a lot of fuel, electricity, and the like. Accordingly, this technique has a serious disadvantage that the modes are extremely uneconomical. In addition, although dioxins are mainly contained in the incineration ashes, but the term "mainly" should be noted herein. In other words, a certain amount of dioxins are included in the exhausted gas which is released to the air. Therefore, the technique has a disadvantage that there is a big question as to whether the dioxins thus released would remain within the regulated value.

[0013]The method of incinerating and decomposing gasified dioxin, which is the third conventional technique, performs incineration at a high temperature in the range from 1500 to 1600 [°C] and therefore consumes a lot of fuel. Accordingly, this method is extremely uneconomical and has a major disadvantage that the method is against the international principle for prevention of global warning.

[0014] The fourth conventional technique is the method of raising the temperature of the exhaust gas from the combustible materials out of the general waste by about 500 [°C] only for decomposition of dioxin. Accordingly, this method is also extremely uneconomical in terms of overuse of fuel, and has a major disadvantage that the method is against the international principle for prevention of global warning.

[0015] The fifth conventional technique is the method of decomposing the substance containing dioxin by irradiating with sunlight or ultraviolet rays. This method is favorable in light of heat economy and has an advantage of not generating carbon dioxide. However, the method has a disadvantage that it takes too much time for decomposing a limited amount of dioxin. Moreover, according to the documents for the conventional technique, the method is carried out in an open space. Therefore, the conventional technique has even more difficulties and remains as an experimental physical method. Accordingly, the method has a critical disadvantage that industrial use is impossible.

[0016] The sixth conventional technique uses the pulse discharge. However, this pulse discharge is a direct-current discharge. Accordingly, this technique has a major problem that dioxin can be easily generated by retrosynthesis.

[0017] An object of the present invention is to create and provide a method and an apparatus for rapid reduction of dioxin, which is capable of eliminating various disadvantages of the numerous conventional techniques described above, avoiding bad economy in term of fuel use, suppressing generation of carbon dioxide to a minimum level, rapidly decomposing dioxin, and lowering equipment costs. Means and configurations of the present invention will be described below.

[0018]

[Means for solving the problems]

A method for rapid reduction of dioxin according to the present invention is characterized by a method using electromagnetic rays for decomposition and reduction of dioxin in

exhaust gas, which includes the steps of sending exhaust gas having temperature adjusted to a range from 300 to 600 [°C] from an inlet in one direction of a container for passing through the exhaust gas, allowing the exhaust gas to pass through toward outlets in plural directions, introducing electromagnetic rays into the container or providing an electromagnetic ray generator at the inside thereof, and allowing other inner surfaces to repeatedly reflect the electromagnetic rays approximately endlessly. Hence, according to the method for rapid reduction of dioxin, portions other than passage holes for the exhaust and a mechanism for removing dusts in the exhaust are hermetically sealed from outside and dioxin is rapidly reduced by such an internal continuous reflection mechanism. Meanwhile, when the electromagnetic rays used in the method for rapid reduction of dioxin are ultraviolet rays, a wavelength of the ultraviolet rays is in a range from 50 to 360 [Nm] inclusive in the method. In comparison with the related art concerning the wavelength of the ultraviolet rays, although a conventional method of generating ultraviolet rays had a difficulty in generating ones having the wavelength equal to or below 340 [Nm], it is possible to generate ones having the wavelength equal to or below 340 [Nm] quite recently. By using ones having the wavelength in the range from 100 to 250 [Nm], it is possible to increase resolving power by about 10 times as high as the related art. Accordingly, the present invention also applies this natural rule. Meanwhile, as another method, the ultraviolet rays to be introduced to the inside of the container may be obtained by a method of separating ultraviolet rays having the wavelength in the above-described range out of full-wave light such as sunlight with a spectroscope, and the ultraviolet rays may be introduced by use of an optical fiber. Alternatively, another method is to dispose one or more generators for ultraviolet rays having the wavelength in the above-described range on an inner wall of the container. The reason for setting the temperature for decomposition processing of dioxin equal to or above 300 [°C] is that dioxin is contained and

exists in a solid phase of a garbage incineration ashes at temperature lower than the above and irradiation of the ultraviolet rays is hardly effective. Meanwhile, the reason for setting the processing temperature equal to or below 600 [°C] is that it is needless to raise the temperature higher than the above in order to perform decomposition of dioxin by using the ultraviolet rays, and such higher temperature is uneconomical. Next, the reason for setting the wavelength of the used ultraviolet rays equal to or above 50 [Nm] is that the ultraviolet rays are apt to be absorbed by minute dust floating in the exhaust gas if a wavelength is shorter than the above, and that a function to decompose dioxin existing in a gas phase is thereby reduced. Moreover, the reason for setting the wavelength equal to or below 360 [Nm] is that a wavelength higher than the above constitutes visible light and the function to decompose dioxin is reduced as well. Furthermore, usual spectrometer and optical fiber are used therein.

[0019] Next, an apparatus for rapid reduction of dioxin according to the present invention is characterized by an apparatus for rapidly reducing dioxin by allowing incineration exhaust gas from combustible waste to pass therethrough while using ultraviolet rays, which includes at least one dioxin rapid reducer arranged in a direction of flow of the exhaust gas. Here, a shape of an inner surface reflector of an exhaust gas passage container is formed into a shape so as to reflect the ultraviolet rays entirely or partially to inside of the exhaust gas passage container. The exhaust gas passage container includes an automatic temperature control mechanism for adjusting temperature of the exhaust gas in a range from 300 to 600 [°C]. The exhaust gas passage container includes any of a mechanism for generating the ultraviolet rays having a wavelength in a range from 100 to 360 [Nm] inclusive, and a mechanism for introducing the ultraviolet rays obtained by separating full-wave light with a spectroscope into the passage container through an optical fiber. Moreover, the dioxin rapid reducer is provided with inner surface reflectors at an inlet and

an outlet for the exhaust gas for reflecting the ultraviolet rays to the inside of the passage container. Meanwhile, as a detailed example of a concrete shape thereof, the ultraviolet rays are reflected entirely or partially to the inner surface of the container either, and the inner surface shape of the container is formed into any of a spherical shape, a cylindrical shape having an axis along a direction of allowing the exhaust gas to pass through or an approximate direction thereof, a spheroidal shape, a paraboloidal shape, and approximate shapes thereof, which is an approximately endless inward reflector. A reflector to the inward direction is also hung at an outlet portion for the exhaust gas. The apparatus for rapid reduction of dioxin is formed by connecting such dioxin rapid reducers in series in the direction of the flow of the exhaust gas as appropriate. A usual automatic temperature control mechanism is used therein.

[0020] Meanwhile, with regard to the dioxin rapid reducer of the present invention, the inner surface reflector thereof is formed either as a curved metal plate having a smooth inner surface and containing a simple substance or an alloy including at least one selected from the group consisting of iron, silver, tin, aluminum, platinum, gold and palladium, or as transparent reinforced glass provided with a thin film on an outer back surface formed by sputtering or vapor deposition, the thin film containing a simple substance or an alloy including at least one selected from the group consisting of copper, silver, tin, aluminum, platinum, gold and palladium.

[0021] Further, the dioxin rapid reducer includes a dust removal mechanism, and the dust removal mechanism is a cyclone dust removal mechanism of an inverse cone shape. The exhaust gas is introduced in a direction of an inner tangential lime of a horizontal cross section thereof. Moreover, at least one unit of the cyclone dust removal mechanism is provided in front of the inlet for the exhaust gas of the dioxin rapid reducer or below the dioxin reducer. One unit or an arrangement of more than two units inclusive of the apparatus for rapid reduction of dioxin of

this combination constitutes one aspect of the apparatus for rapid reduction of dioxin of the present invention.

[0022] In addition, the dust removal mechanism is the apparatus for rapid reduction of dioxin. A frame of a wiper for wiping the inner surface is formed by use of heat-resistant manganese steel, titanium steel or the like. Meanwhile, normally used heat-resistant metal fibers, rock wool fibers, or the like are used for a brush portion. Furthermore, an electric circuit for a windshield wiper normally used as electronic equipment for an automobile is used for a reciprocating mechanism.

[0023]

[Embodiments of the Invention]

According to an embodiment of the method for rapid reduction of dioxin of the present invention, dioxin enters a gas phase at garbage incineration temperature in a range from 300 to 600 [°C] or more preferably at temperature close to 500 [°C], and is exposed to ultraviolet rays efficiently and thereby becomes more decomposable. Exhaust gas is put into a dust removing cyclone in a direction of a tangential line. The exhaust gas after undergoing dust removal is introduced to a dioxin rapid reducer of an inward direction continuous reflection type. This dioxin is guided to a subsequent dust removing cyclone by further providing an exhaust hole on an upper part. The dioxin rapid reducer adopts the method of using the one having the inner surface direction reflective type as described above. A usual method is applied to the automatic control of processing temperature, and each outside of the dust removing cyclone and the dioxin rapid reducer hold heat using usual heat retaining function means. When using radiation rays, method of using a protection layer on the outside is applied at the same time.

[0024] (Embodiment 1)

Fig. 1 is an explanatory view of a dioxin rapid reducer 1 and a dust remover 3 showing one embodiment of the present invention. An introduction pipe 2 for exhaust gas from a garbage incinerator is provided so as to be connected sideways to a

cyclone-type dust collector 3. Temperature of exhaust gas 4 is maintained preferably in a range from 350 to 550 [°C] from a stage at the garbage incinerator by automatic control. A usual automatic temperature control mechanism is used herein, and illustration thereof is omitted. The exhaust gas 4 after dust removal to some extent is sent in from a lower part of the dioxin rapid reducer 1. Fig. 2 is a horizontal cross-sectional view of Fig. 1, and tiny dusts are removed downward by the cyclone mechanism. The dioxin rapid reducer 1 is an approximate paraboloid having an axis in a moving direction of the exhaust gas, which is formed into a shape slightly close to a spheroid. Fig. 3 is a B-B horizontal cross-sectional view. An inner surface of the dioxin rapid reducer is formed by finishing a transparent reinforced glass 5. Since a reflective vapor deposited material on a back side is very thin, use of expensive metal does not largely affect a total cost of the apparatus. Accordingly, platinum will be used herein. Twenty-four units of ultraviolet ray generators 6 are provided inside the reinforced glass. With regard to portions without provision of the ultraviolet ray generators 6 are provided with a reflective film 7 formed by vapor depositing a thin film of reflective metal on the back surface outside the reinforced glass. Then the outside is covered with a heat retaining layer 8, and outside thereof is enclosed by an iron structure body 9 for retaining strength. Although the thermal expansion coefficient of iron is greater than that of glass, a breakage can be avoided by using soft rock wool or the like as the heat retaining layer 8. As an operation, a wavelength of about 250 [Nm] is generated from the ultraviolet ray generators 6. With the condition that using a discharge lamp for this ultraviolet ray generation is used, since the lamps for various wavelengths are manufactured and are commercially available, it is preferable to use one having a wavelength in a range from 100 to 250 [Nm] inclusive as described above. Fig. 4 is an ultraviolet ray generation circuit used in the present invention. An alternating current power is inputted from a power source 11 to a rectifier circuit 12 and converted into a

stable direct current, and is then supplied to an inverter 13 and inputted to the discharge lamp for ultraviolet ray generation, i.e. an ultraviolet ray generator 5, thus generating the ultraviolet rays. The generated ultraviolet rays are reflected slightly inward with respect to a horizon because the inner surface reflector is formed into the intermediate shape between the paraboloid and the spheroid. These reflected rays are reflected again and such reflection is repeated almost endlessly. Since this occurs at a speed of an electromagnetic wave, the rays pass through the exhaust gas moving slowly upward repeatedly and endlessly, which seems almost virtually motionless in contrast to the speed of light. Since decomposition of dioxin in the exhaust gas by this operation is carried out in accordance with a numerical theory, it is possible to simulate with a personal computer. The following is a result of simulation based on publicly known physical data that dioxin completely disappears in about 8 hours when conventionally generatable ultraviolet rays having a wavelength of about 350 [Nm] are irradiated onto gas containing dioxin. By using the ultraviolet rays having a previously unavailable wavelength, resolving power becomes about 10 times higher and time is therefore reduced to about 1/10. Electric power of the ultraviolet ray generator is 40 [W] in this embodiment. However, since the 24 units are used herein, the decomposition time is reduced to 1/24. Further, the absorbency index for the electromagnetic rays by the reinforced glass reflector having platinum vapor deposition on the back surface as described above is about 30 [%]. Since it is possible to ignore heat losses, the reflector accounts for about 70 [%]. Therefore, reflection for 6 times reduces the value equal to or below 10 [%]. Accordingly, an accumulated reflection amount is about two times as large as a generated amount, and the resolving power is about 3 times greater. Hence, the decomposition time for such a factor becomes 1/3. The above-described three factors can be summarized as (1/24) × (1/10) × (1/3=1/720). Meanwhile, according to the above-described physical related art, dioxin disappears in about 8

minutes or 29000 [seconds] by the ultraviolet rays. Therefore, dioxin will disappear in 1/720 of the foregoing time, or in other words, in about 40 [seconds] by use one stage of the rapid reducer of the present invention. However, it seems still inadequate because the speed of the exhaust gas moving upward inside the rapid reducer is considered to be normally in a range from 3 to 5 [m/sec]. Accordingly, by connecting another set of the dust collector and the rapid reducer of the same constitution ahead, the time is further reduced to 1/720. If this is simulated by calculation in terms of time, the time is about 0.17 [second]. Hence, dioxin in the exhaust gas will disappear in a very short time period. The decomposition is performed instantly and cumulatively. By introducing this exhaust gas from sideways below the dioxin rapid reduction provided with the dust remover at the second stage, dioxin will be reduced even more rapidly. The above-described wiper-type dust removal mechanism is also provided on the inner surface of the rapid reducer at the second stage when appropriate.

[0025] (Embodiment 2)

In this embodiment, the dioxin rapid reducer is formed into a cylindrical shape. Here, the reflected rays tend escape upward and downward. Accordingly, by forming a horizontal cross section into an intermediate shape between a parabola and an ellipse and thereby forming an approximately elliptical cylinder, the inward reflection performance is relatively improved and manufacturing costs are relatively low. Also by increasing the length, an effect of rapid reduction of dioxin is sufficiently achievable.

[0026]

[Effects of the Invention]

1) The method and the apparatus for rapid reduction of dioxin of the present invention has a significant effect that dioxin in garbage incineration exhaust gas rapidly gets closer and closer to 0 and falls well below a toxic range, and exerts an enormous effect of possibility to substantially resolve major social problems today.

2) The ultraviolet ray generator used in the method and the

apparatus for rapid reduction of dioxin of the present invention is a new product having a shorter wavelength than a conventional product. However, the unit price is 1100 yen. Accordingly, the cost will be only around 100,000 yen when using 100 units. Meanwhile, with regard to the reflector, precious metal is vapor deposited and formed into a very thin film. Therefore, there is a major effect that the equipment costs are low as a whole, which are affordable by small and medium sized operators.

3) The processing temperature in the present invention is equal to or below 600 [°C]. Accordingly, there is also a major effect that costs for daily operations are extremely lower than a conventional case.

[Brief description of the drawings]

[Figure 1]

Fig. 1 is a vertical cross-sectional explanatory view of a dioxin rapid reducer and a dust remover according to one embodiment of the present invention.

[Figure 2]

Fig. 2 is a horizontal cross-sectional view of the dust remover for the dioxin rapid reducer according to the one embodiment of the present invention.

[Figure 3]

Fig. 3 is a horizontal cross-sectional explanatory view of the dust remover for the dioxin rapid reducer according to the one embodiment of the present invention.

[Figure 4]

Fig. 4 is a circuit block diagram of an ultraviolet ray generator used in the present invention.

[Figure 5]

Fig. 5 is a vertical cross-sectional view of a dioxin rapid reducer according to another embodiment of the present invention.

[Figure 6]

Fig. 6 is a horizontal cross-sectional view of the dioxin rapid reducer according to the other embodiment of the present invention.

[Explanation of referenced numerals]

1 DIOXIN RAPID REDUCER
2 INTRODUCTION PIPE
3 CYCLONE-TYPE DUST REMOVER
4 EXHAUST GAS
5 TRANSPARENT REINFORCED GLASS
6 ULTRAVIIOLET RAY GENERATOR
7 REFLECTIVE FILM
8 HEAT RETAINING LAYER
9 IRON STRUCTURE BODY
10 ULTRAVIOLET RAYS
11 POWER SOURCE
12 RECTIFIER CIRCUIT
13 INVERTER

Fig.2

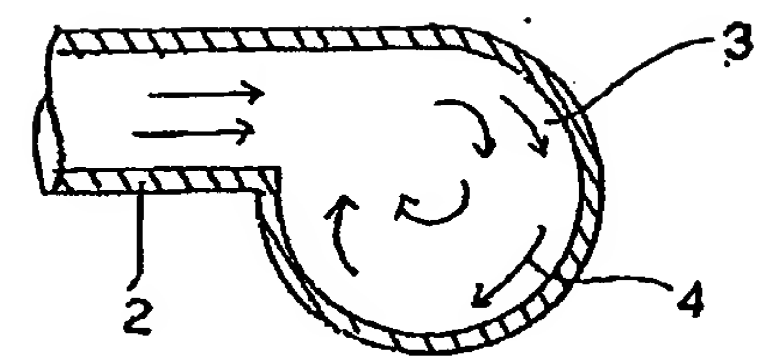


Fig.4

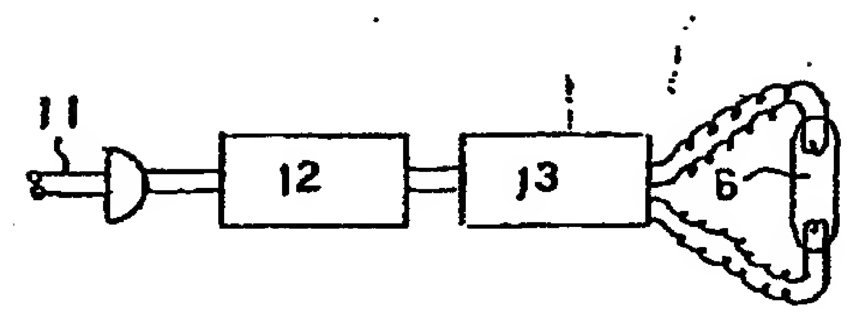


Fig.1

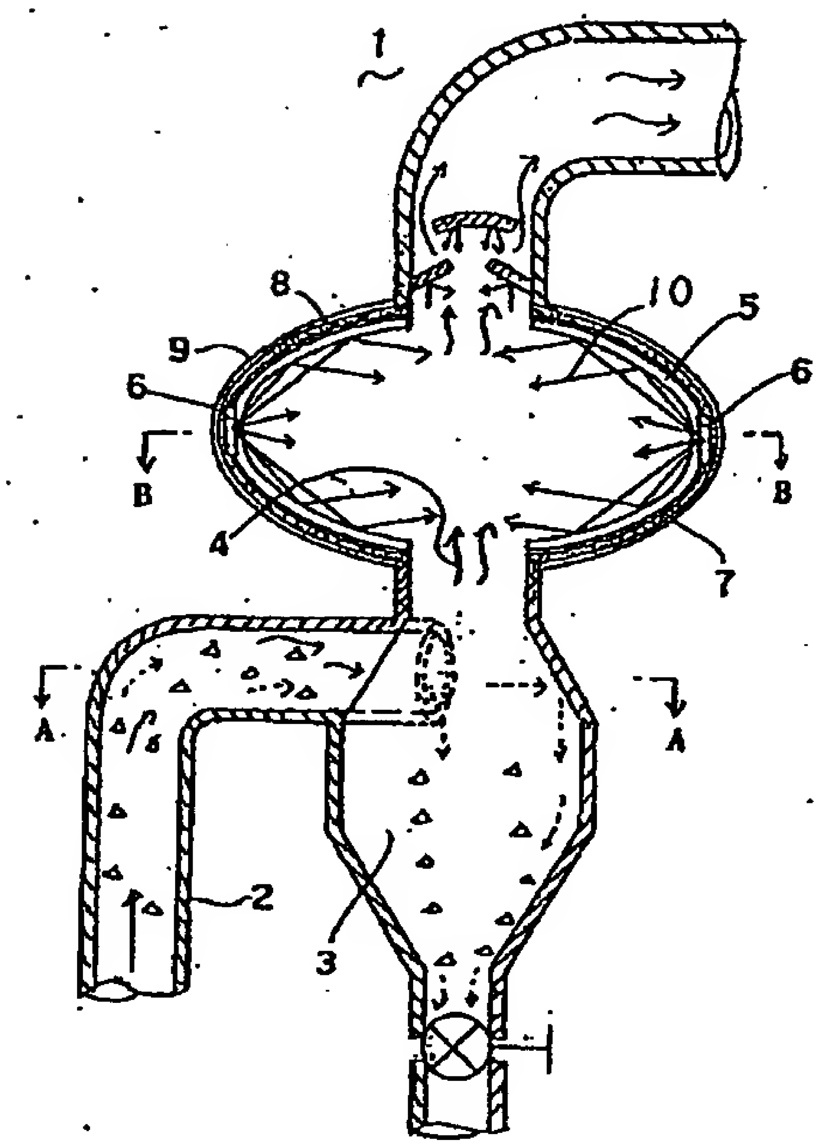


Fig.3

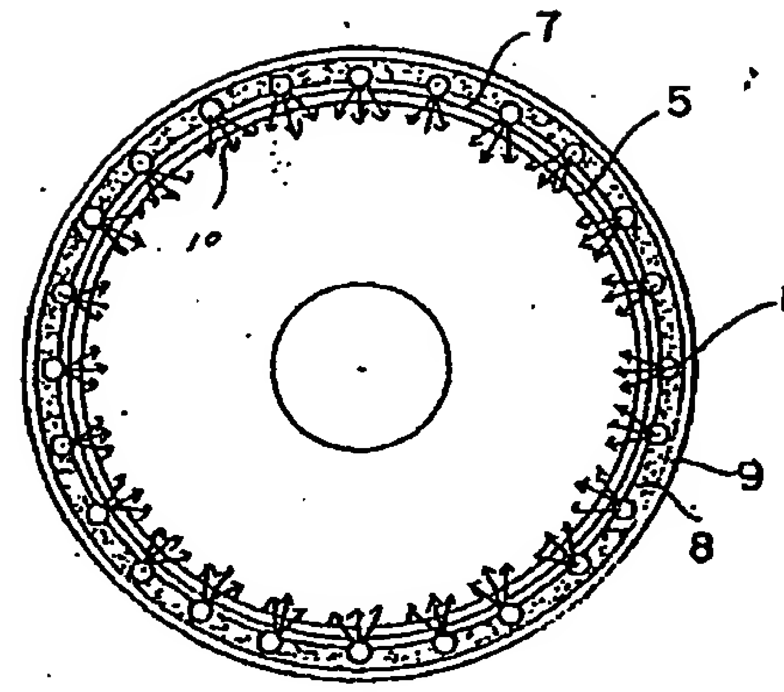


Fig.5

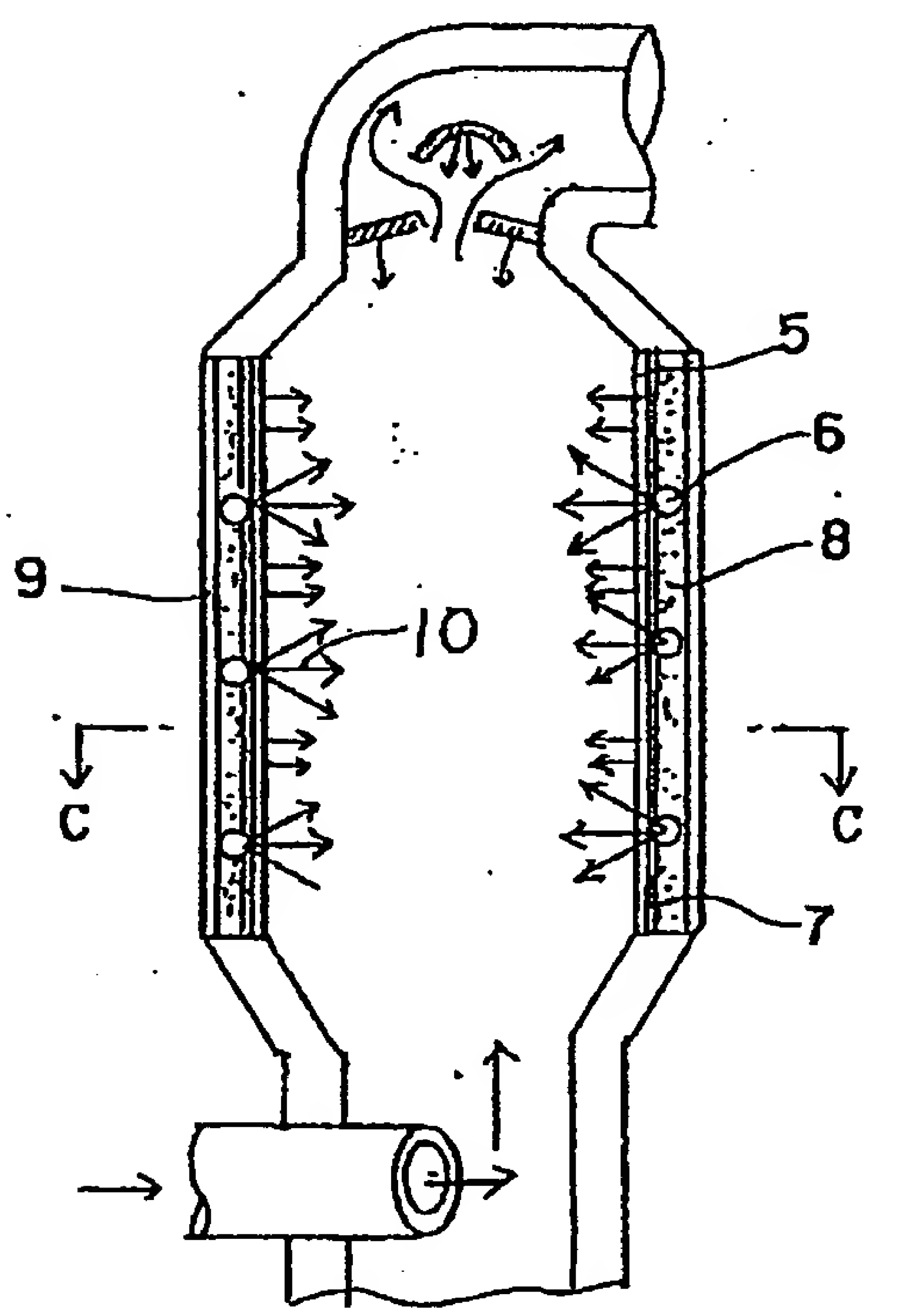


Fig.6